

NASA Astrobiology Early career award 2015

Report by Dr. Daniel Angerhausen, NASA-GSFC

The NASA Astrobiology Early career award 2015 was awarded to collaborate with Antonio García Muñoz (ESA Scientific Support Office) and the International Space Science Institute (ISSI) team, and with Andrea Chiavassa (CNRS) and members of the NASA Astrobiology Institute Thermodynamics, Disequilibrium and Evolution (NAI - TDE) Focus Group. The grant was used to travel to two workshops in Europe, which were mainly kick-off meetings for larger and long-term future collaborations. At the TDE focus group meeting in Nice, that was mostly attended by modelers, I contributed with the observational expertise on a wide range of platforms, wavelengths and instruments, while at the same time having a basic understanding of and experience in inter-disciplinary work with all the other connected fields. The ESA Working Meeting 'Exoplanet atmosphere characterization with space-borne optical photometry' 14-18 December in Noordwijk, Netherlands was meant to bring together a group of leading experts in this field to kick-off long term collaborations in this emerging area of exoplanet science. The goals were to exchange expertise and identify future collaboration opportunities using data from photometric space missions such as NASA's TESS and ESA's CHEOPS and PLATO over the next decades.

The Title of my presentation at both meeting was *Sniffing Alien Atmospheres: Exoplanet spectrophotometry (from ground-, airborne- and spacebased observatories)*. In my presentations I gave a short introduction to the technique of transit, eclipse and phase curve spectro-photometry. I described my various projects in this emerging field using state of the art spectroscopic and photometric instruments on the largest ground based telescopes, the 'flying telescope' SOFIA (Stratospheric Observatory for Infrared Astronomy) and the Kepler and Hubble space telescopes. Furthermore I gave an overview of upcoming missions (such as JWST, TESS, EXO-C/S, LUVOIR/ATLAST/HDST) and their potential to advance this field.

A quick summary and overview for both meeting is given below. Both workshops were extremely successful and informative. Many potential future project were identified and I am sure my future career will benefit a lot from the connections made possible by this NAI early career award.

Exoplanetary Atmospheres and Habitability

Thermodynamics, Disequilibrium and Evolution focus group

12-16 Oct 2015 Nice (France)

Attendance, in person total: ~35-40 (varied by day)

- Early career scientists (undergrad, Ph. D., post doc): ~30

Attendance, Adobe Connect total: ~15

- Averaged ~5 per day, 2 consistent repeat visitors each day
- Max 7 visitors at one time

ESA Working Meeting

'Exoplanet atmosphere characterization with space-borne optical photometry'

14-18 December Noordwijk , Netherlands

Attendance, in person total: ~8-10 (varied by day)

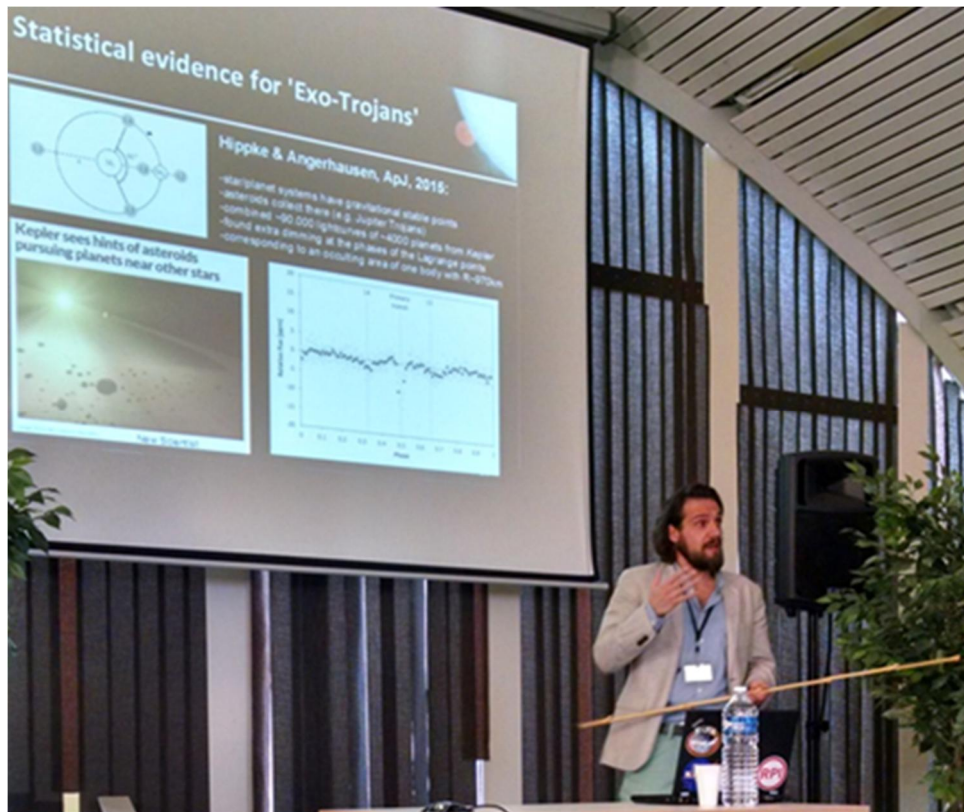
Attendance, Adobe Connect total: ~2-3 (varied by day)

Potential products

- white paper (collect references, split subsections...)
- review paper (incl. Nomenclature!)
- requirements for future missions leading to study (phase space not covered by upcoming mission)
- follow up workshop/conference/splinter-meeting (lessons learned from this one?)



Group Picture Nice meeting



Presenting at the TDE workshop, Nice, FR.



Presenting at ESA-ESTEC, Noordwijk, NL